United States Patent [19]

Dehari et al.

[11] **Patent Number: 4,774,866**

[45] **Date of Patent: Oct. 4, 1988**

[54] **BLADE GUARD ARRANGEMENT IN MOTOR-DRIVEN CHOP SAW**

[75] Inventors: **Tomoshige Dehari**, Hiroshima; **Kouichi Miyamoto**, Fuchu, both of Japan

[73] Assignee: **Ryobi Ltd.**, Hiroshima, Japan

[21] Appl. No.: **141,412**

[22] Filed: **Jan. 7, 1988**

[30] **Foreign Application Priority Data**

Jan. 12, 1987 [JP] Japan ..... 62-3258[U]

[51] **Int. Cl.**[4] **B23D 19/00**; B26D 1/14

[52] **U.S. Cl.** ..... **83/478**; 83/490; 83/397; 83/DIG. 1; 30/391; 144/251 R

[58] **Field of Search** ..... 83/478, 490, 397, 546, 83/481, 484, 581, DIG. 1; 30/390, 391; 144/251 R, 251 A, 251 B, 216

[56] **References Cited**

U.S. PATENT DOCUMENTS

1,711,490	5/1929	Drummond	83/478
1,900,553	3/1933	Hampton	83/397
2,737,985	3/1956	Utz	30/391
3,922,785	12/1975	Fushiya	83/478
4,002,094	1/1977	Erickson et al.	83/471.3
4,028,975	6/1977	Bennett	83/490
4,176,571	12/1979	Batson	83/397
4,318,324	3/1982	Hall et al.	83/397
4,489,633	12/1984	van de Wouw	83/478
4,581,966	4/1986	Kaiser et al.	83/397

FOREIGN PATENT DOCUMENTS

631535	8/1982	Czechoslovakia	83/478
2248512	6/1973	Fed. Rep. of Germany	30/391

Primary Examiner—Frank T. Yost
Assistant Examiner—Scott A. Smith
Attorney, Agent, or Firm—Parkhurst, Oliff & Berridge

[57] **ABSTRACT**

A saw-blade guard arrangement in a motor driven chop saw which includes a new unit pivotally mounted for movement between an upper rest position and a lower operational position. The saw unit is pivotably connected to a hinging member through a pivot shaft, and the unit includes an upper safety guard, a motor casing integral with the upper guard, a saw blade fixed to a drive shaft connected to a motor shaft, and a lower guard rotatable to a first direction for covering a part of the saw blade when the saw unit is in the upper rest position and rotatable to a second direction when the unit is moved to the lower operational position. The blade guard arrangement comprises a first biasing means disposed between the upper safety guard and the hinging member, an operation arm having one end portion pivotally rotatable about the pivot shaft, a link member having one end pivotably connected to the other end of the operation arm and having the other end pivotally connected to the lower guard, a second biasing means disposed between the operation arm and the hinging member, and an adjusting means for controlling orientation of the operation arm.

5 Claims, 5 Drawing Sheets

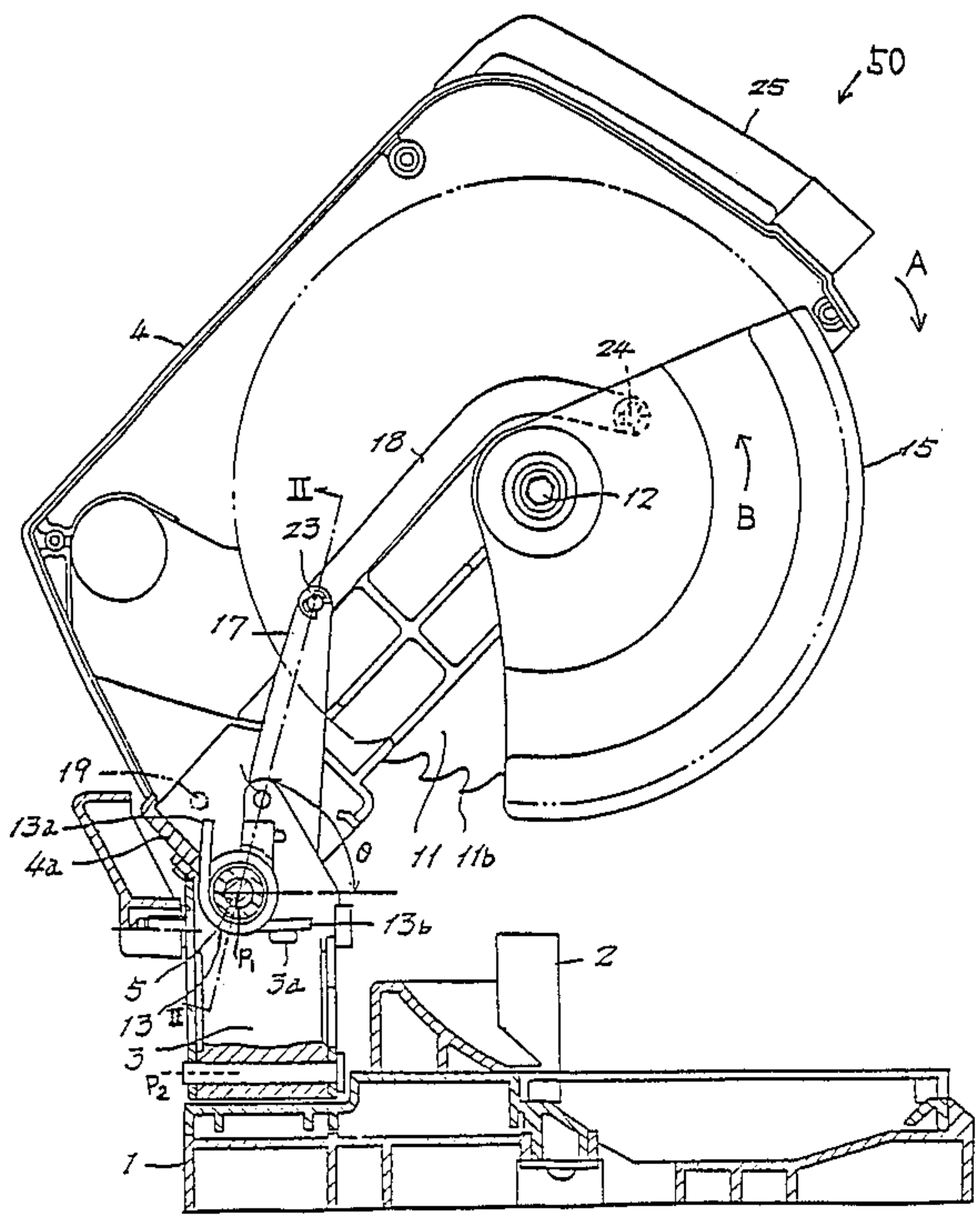


Fig. 1

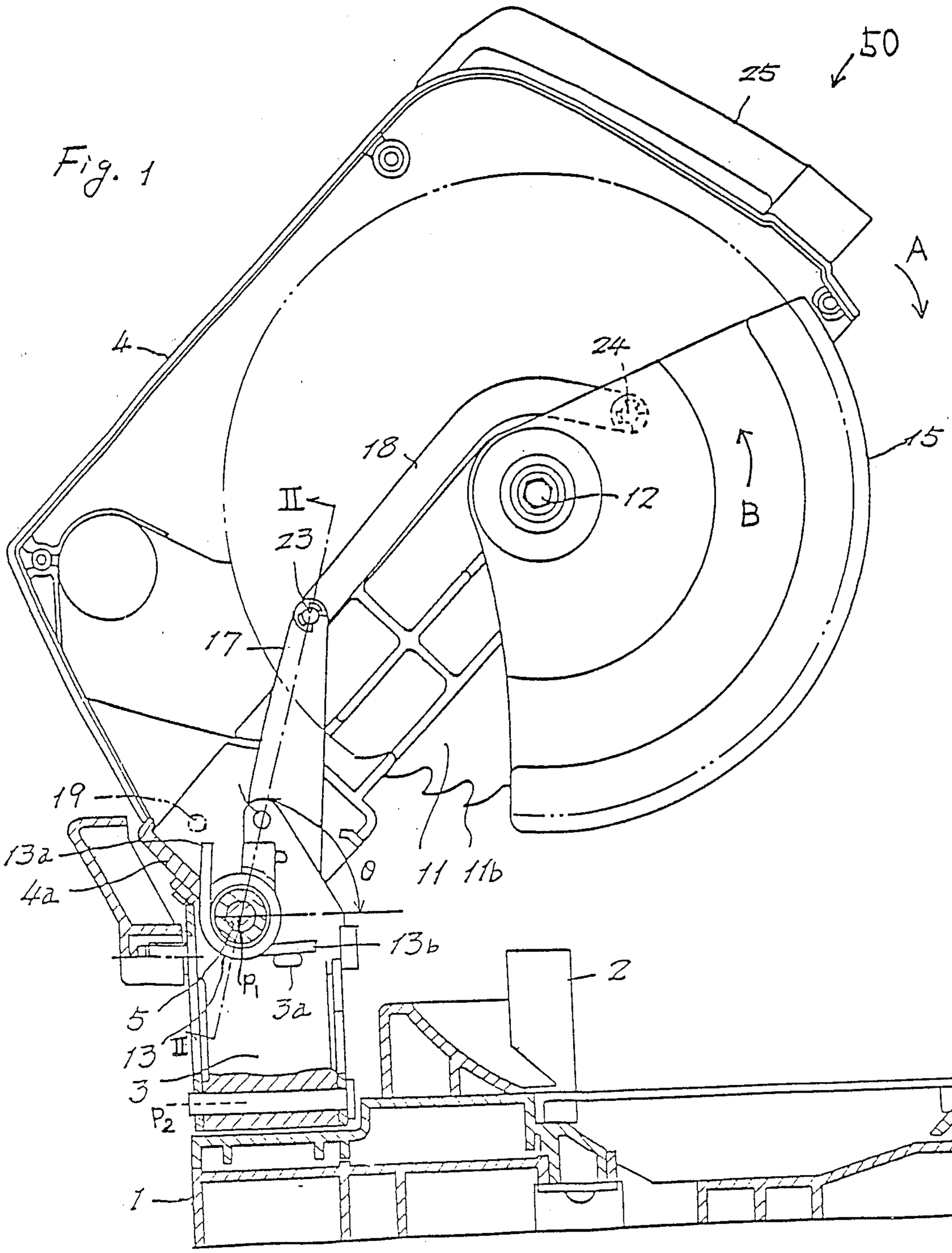
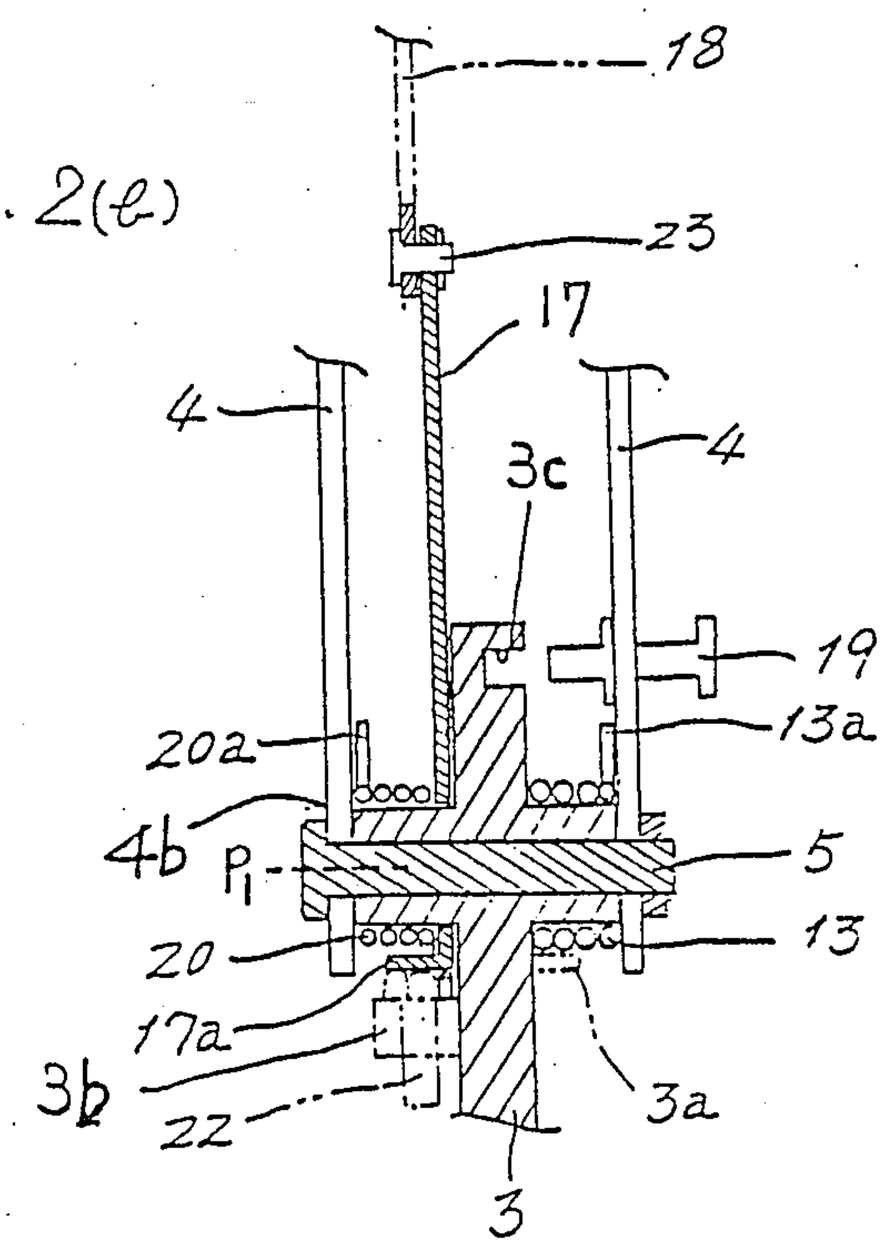

50
25
A
4
24
18
15
II
23
12
B
17
19
13a
4a
0
11
11b
13b
2
P1
3a
5
13
II
3
P2
1

Fig. 2(e)



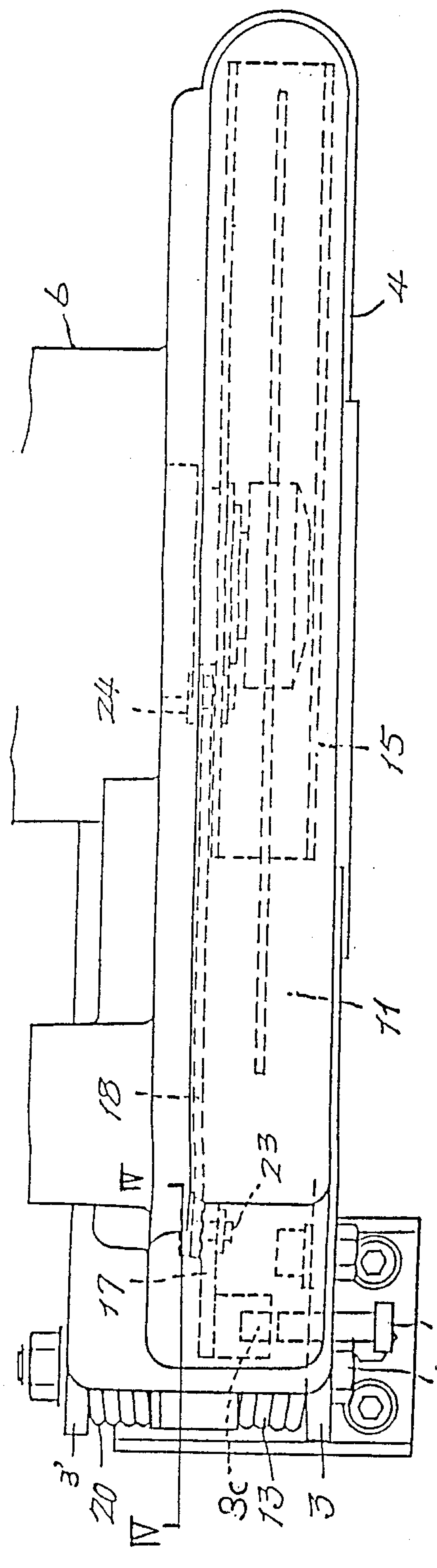

6
4
24
15
18
71
IV
23
17
5
19
3'
20
3c
13
3

Fig. 2(a)

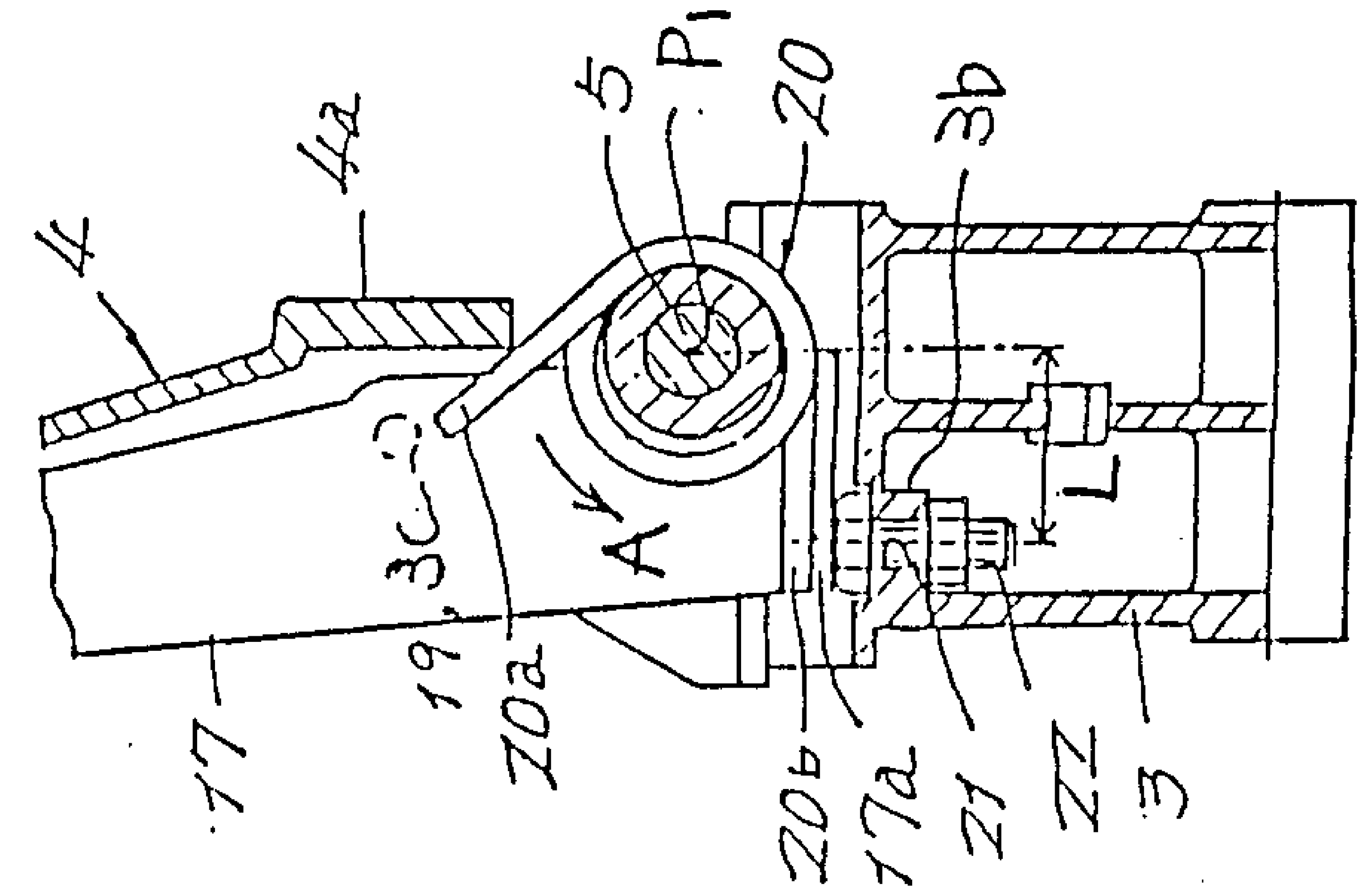

4
4a
5
P1
20
3b
L
A
19, 3c
20a
17
20b
17a
21
22
3

Fig. 4

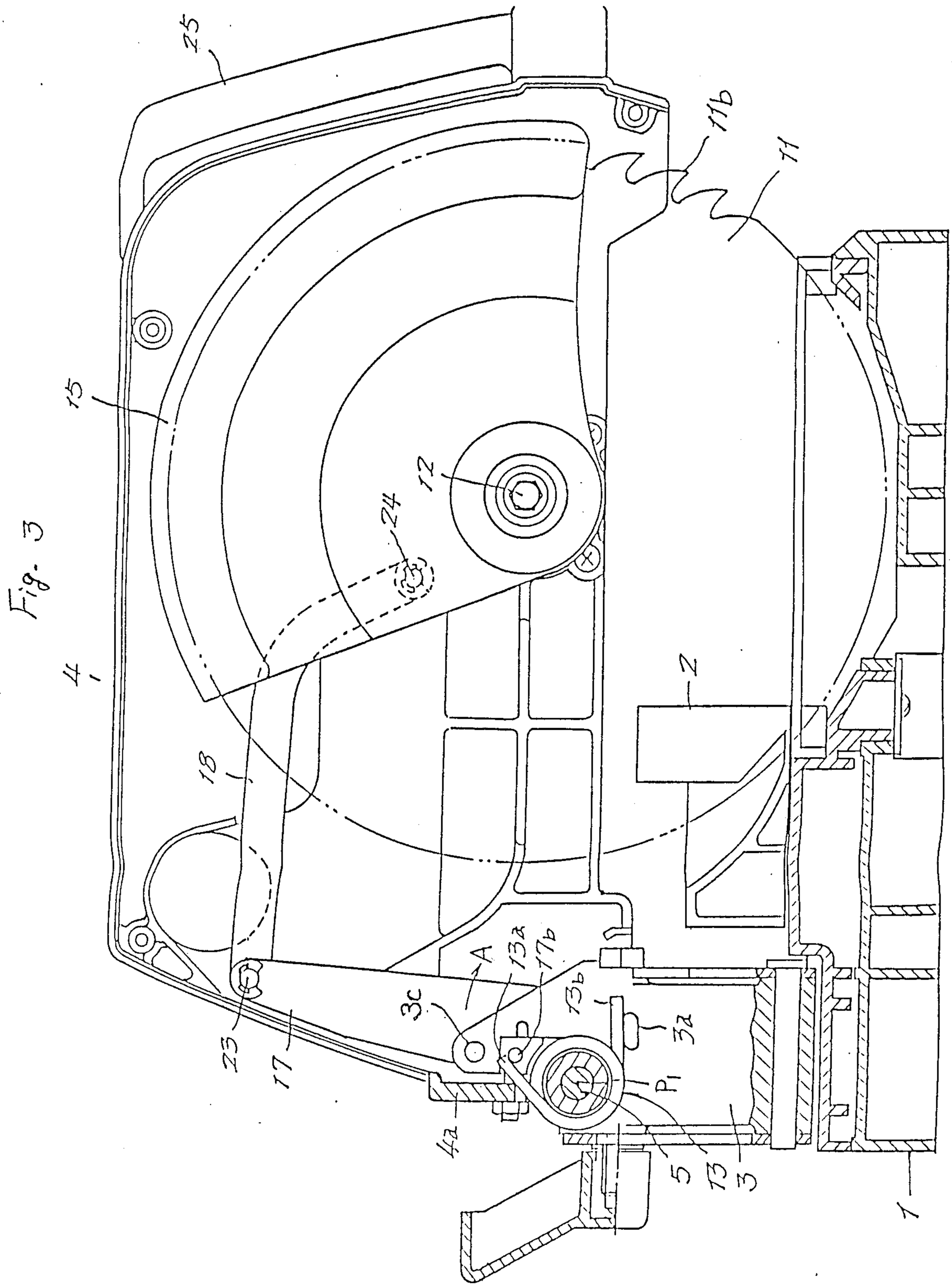


Fig. 3

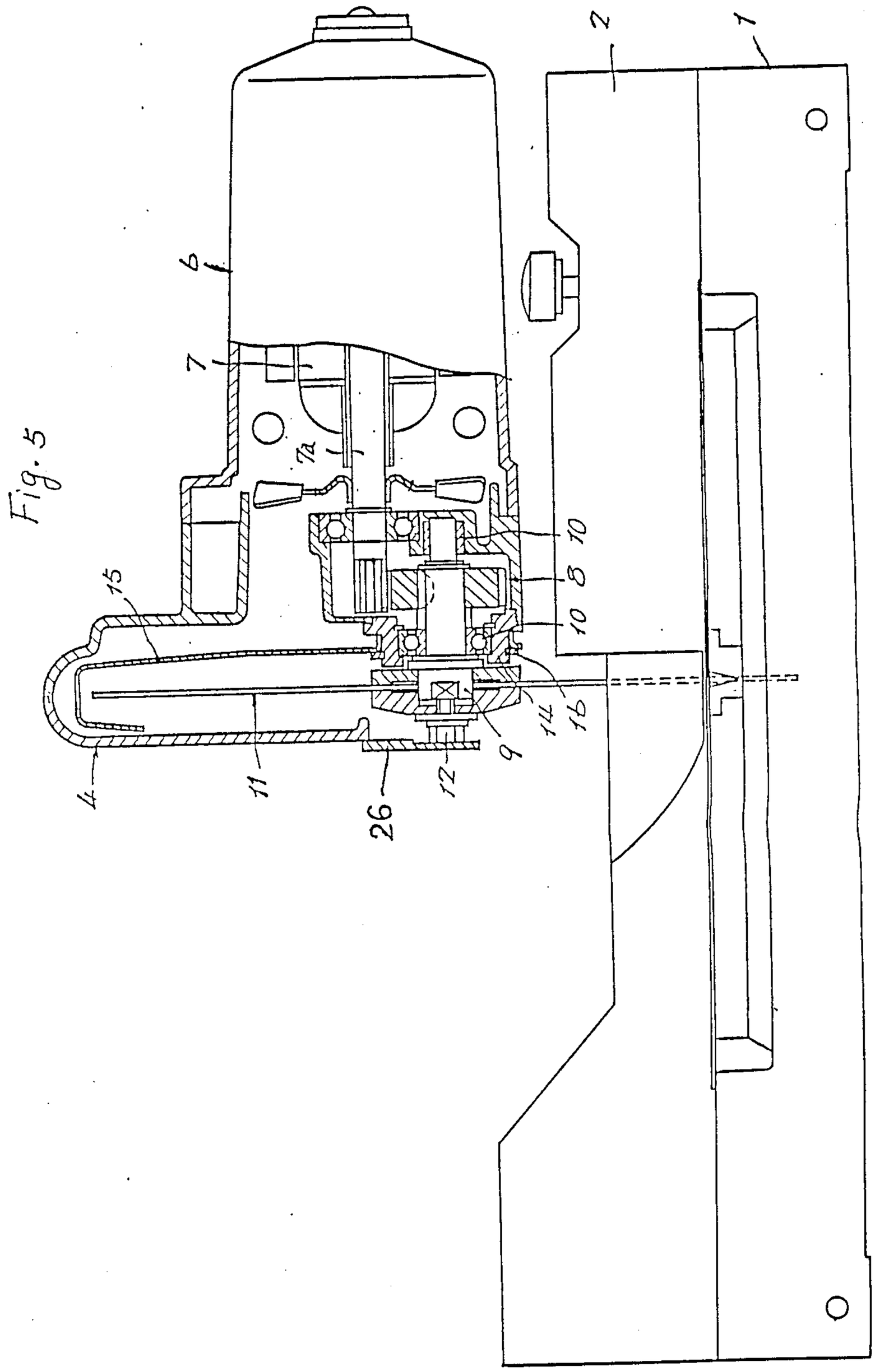


Fig. 5

BLADE GUARD ARRANGEMENT IN MOTOR-DRIVEN CHOP SAW

BACKGROUND OF THE INVENTION

The present invention relates to a blade guard arrangement in a motor driven chop saw, and more particularly to a lower blade guard arrangement in the chop saw which is pivotally mounted for movement between a raised rest position and a lowered operational position.

The chop saw generally provides an upper safety guard which partially encases a circular saw-blade, and a swingable lower blade guard which covers the exposed segment of the saw-blade when the saw is in the raised rest position. When the upper safety guard is pivotally moved to the lowered operational position about a pivot shaft, the swingable lower blade guard is rotated to expose the saw-blade segment so as to chop wood or metal member mounted on a saw table with the circular sawblade. Such arrangement is well known in the art.

Further, according to one of the conventional arrangement, in response to the pivotal movements of the upper safety guard together with the circular sawblade, the lower guard is pivotted by way of an actuation lever. In the latter type of arrangement, the actuation lever has one end portion pivotably connected to a frame element through a slide hinge which includes a pivot bolt engaged with a slot, and has the other end pivotally connected to the lower guard. Further, a tension springs are disposed each between the frame element and the upper blade guard in order to bias the upper blade guard and the circular saw-blade toward upper rest position. Such an arrangement is disclosed in U.S. Pat. No. 4,581,966.

With the structure, it would be rather troublesome to pivot the lower guard for exposing the saw-blade when the saw unit is at the upper rest position, if maintenance or changing of the saw-blade is required. More specifically, it is necessary to axially move the pivot bolt so as to allow actuation lever to slide along the pivot bolt in order to raise the lower blade guard without moving the saw unit from its rest position.

Further, with the structure, it would be impossible to adjust angular position of the lower guard so as to control a covering range with respect to the blade segment when the saw unit is in the rest position. Therefore, if the saw unit is assembled with having dimensional errors of the mechanical segments, the exposed blade portion is not sufficiently covered with the lower guard at the rest position. In order to avoid this problem, high dimensional accuracy is required for the assembly, which however is costly and requires nervous assembling labour.

SUMMARY OF THE INVENTION

It is therefore, an object of the present invention to overcome the above-described drawbacks and to provide an improved blade guard arrangement in a motor driven circular saw.

Another object of this invention is to provide such arrangement which facilitates pivotal movement of the lower blade guard when the saw unit is at its upper rest position.

Still another object of this invention is to provide such arrangement capable of controlling covering zone

of the lower blade guard with respect to the blade segment which is not covered with the upper blade guard.

In a motor driven chop saw, there are generally provided a saw table, a hinging member extending from the saw table and having a pivot shaft, and a saw unit pivotally movable with respect to the hinging member. The saw unit includes an upper safety guard for partially encasing the saw blade, the upper safety guard pivotably connected to the hinging member through the pivot shaft, a motor casing integrally connected to the upper safety guard, a motor housed in the motor casing, a drive shaft connected to the motor and fixing the sawblade for its rotation, and a lower guard rotatable to a first direction for covering an exposed segment of the saw blade when the saw unit is in the upper rest position and rotatable to a second direction for uncovering said segment when the saw-unit is moved to the lowered operational position. A sawblade guard arrangement according to the present invention comprises a first biasing means, an operation arm, a link member, a second biasing means, and an adjusting means. The first biasing means is disposed between the upper safety guard and the hinging member for urging the upper safety guard toward its upper rest position. The operation arm has one end portion pivotally rotatable about the pivot shaft. The link member has one end pivotally connected to the other end of the operation arm, and has the other end pivotally connected to the lower guard, the lower guard being pivotally connected to a bearing portion of the drive shaft. The second biasing means is disposed between the operation arm and the hinging member for urging the operation arm to a direction for urging the lower guard to the first direction. The adjusting means is adapted for controlling orientation of the operation arm. The adjusting means is provided on the hinging member at a position adjacent an end face of the one end portion of the operation arm.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings;

FIG. **1** is a side view partially crosssectioned showing a blade guard arrangement in a saw unit in its upper rest position according to one embodiment of the present invention;

FIG. **2**(*a*) is a plan view of an embodiment shown in FIG. **1** in its operational position;

FIG. **2**(*b*) is a cross-sectional view taken along the line II—II of FIG. **1**;

FIG. **3** is a side view partially crosssectioned showing a lower operational position of the saw unit according to the embodiment;

FIG. **4** is a cross-sectional view taken along the line IV—IV of FIG. **2**(*a*); and,

FIG. **5** is a front view partially crosssectioned showing a lower operational position of the saw unit according to the embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENT

One embodiment according to the present invention will be described with reference to accompanying drawings. A saw table **1** mounts a workpiece stop **2** thereon, and pivotally mounts a hinging member **3** which is pivotable about a pivot axis P_2 at a position outside the workpiece stop **2**. A saw-unit **50** is pivotably mounted on the saw table **1** for movement between a raised rest position (FIG. **1**) and a lowered operational position (FIG. **3**). More specifically, the saw unit **50**

includes an upper safety guard **4** which is integrally provided with a motor **7**, a motor casing **6**, a reduction gear mechanism **8**, circular saw blade **11**, and a lower blade guard **15**. The upper safety guard **4** partially encases the blade **11**, and the lower guard **15** immovably encases the exposed portion of the saw blade **11** when the saw-unit is in the upper rest position. Such structure is generally known in this art.

In the present invention, a base end portion **4***b* of the upper safety guard **4** is pivotably mounted to the hinging member **3** through a pivot shaft **5** including a bolt and a nut, so that the saw unit **50** is pivotable in vertical direction. The upper guard **4** is pivotable about a pivot axis P_1 extending perpendicular to the pivot axis P_2. Further, a torsion spring **13** (first biasing means) is provided to urge the saw unit **50** toward upper rest position. The torsion spring **13** has one end **13***a* secured to an inner end face **4***a* of a rear wall of the upper safety guard **4**, and has the other end **13***b* secured to a spring seat **3***a* projecting from the hinging member **3**. The spring **13** is disposed over the pivot shaft **5**.

As shown in FIG. **5**, the motor casing **6** is secured to an external end face of the upper safety guard **4**. In the motor casing **6**, there is provided the drive motor **7** whose motor shaft **7***a* is drivingly connected to a saw blade drive shaft **9** through the reduction gear mechanism **8**. The drive shaft **9** extends through the circular saw blade **11**, and is rotatably supported by bearings **10**. Planar end of the drive shaft projects out of the blade **11** and the blade **11** is detachably secured thereto by a fastening bolt **12** threadingly engaged with the end portion of the shaft **9**. A cylindrical bushing **14** is disposed over the drive shaft **9** for supporting the same, and the lower guard **15** is rotatably mounted over the cylindrical bushing **14**. Further, a stop ring **16** is fixed to the bushing **14** to prevent the lower guard **15** from its axial displacement and disassembly.

As shown in FIG. **5**, in the operational position of the saw unit **50**, generally upper half portion of the blade **11** is encased by the upper safety guard **4**, and remaining lower half portion **11***b* thereof is exposed to thereby perform sawing or chopping operation to a workpiece (not shown) mounted on the saw table **1**.

The lower guard **15** has a sufficient circumferential length for covering the exposed portion **11***b* of the saw blade **11**. The lower guard **15** is of sector shape and has U-shape cross-section at its radially outermost portion as shown in FIG. **5**. The lower guard **15** is pivotable about an axis of the drive shaft **9**. That is, the lower guard **15** is moved to cover the exposed portion **11***b* when the saw unit **50** is at its upper rest position, and is moved to expose the portion **11***b* when the saw unit is at its lower operational position. Such movement is generally achieved by an operation arm **17**, a link **18** and a torsion spring **20**.

The operation arm **17** has a lower end portion pivotable about the pivot shaft **5** and an upper end portion pivotably connecting one end portion of the link **18** through a pin **23**. The other end portion of the link **18** is pivotally connected to the lower guard **15** through a pin **24**. The position of the pin **24** is offset from the drive shaft **9**.

As is apparent from the above, pivot axis of the operation arm **17** is coincident with that of the upper safety guard **4**, i.e., the axis P_1 of the pivot shaft **5**. As shown in FIGS. **2**(*b*) and **4**, a second torsion spring **20** (second biasing means) is disposed over the pivot shaft **5**. The second spring **20** has one end **20***a* secured to an inner face of the rear wall **4***a* of the upper safety guard **4**, and the other end **20***b* secured to a bottom wall **17***a* of the lower end portion of the operation arm **17**. Therefore, the second spring **20** urges the operation arm **17** toward a direction shown by an arrow A in FIGS. **3** and **4**, as well as urges the upper safety guard toward its upper rest position, the latter function being the same as that derived from the first spring **13**.

Further, in the present invention, provided is an adjusting means for adjusting orientation of the operation arm **17**. The adjusting means includes an adjusting bolt **22** extending in vertical direction. The adjusting bolt **22** is threadingly engaged with a female thread **21** formed in a rib **3***b* of the hinging member **3** as shown in FIGS. **2**(*b*) and **4**. The rib **3***b* confronts a bottom wall **17***a* of the operation arm **17**, and is positioned closer to the blade **11** than the pivot axis P_1 by a length L. Therefore, a head of the bolt **22** is in abutment with the bottom wall **17***a* portion which is positioned closer to the blade **11** than the remaining bottom wall portion (see FIG. **4**). Since the operation arm **17** is urged toward a direction A by the second spring **20**, i.e., since the bottom wall **17***a* is normally urged toward the bolt head, the inclination of the operation arm **17** is controllable and the inclination is maintainable by axial displacement of the bolt **22** relative to the rib **3***a*. That is, the operation arm **17** is rotated to a direction A or to a inverse direction by the treading movement of the bolt **22**.

Incidentally, as shown, a locking pin **19** is slidably provided to the upper safety guard **4**, and a recess **3***c* is formed in the hinging member **3**. The locking pin **19** is engageable with the recess **3***c* in order to maintain the lower operational position of the upper safety guard **4**. Further, a handle **25** is provided on the upper safety guard **4** at a position opposite the base end portion **4***b* so as to manually pivot the saw unit **50**. A cover plate **26** (FIG. **5**) is secured to the safety guard **4** and over the bolt **12**.

In operation, when an operator manually rotate the upper safety guard **4** in a direction A by gripping and pushing down the handle **25**, the lower guard **15** is pivoted in a direction shown by an arrow B (counterclockwise direction in FIG. **1**) by way of the stationarily held operation arm **17** and the movable link **18**. In this case, entire lower guard **15** is moved downwardly together with the downward movement of the saw unit **50**. However, downward movement of the lower guard **15** is restrained by the link **18**, since the link **18** is connected to the lower guard **15** at the pivot pin **24** positioned offset the drive shaft **9**. Therefore, the lower guard **15** is brought into a position shown in FIG. **3** in which the saw blade **11** is exposed by a portion **11**b, to thus perform sawing operation.

When the saw unit **50** is moved upwardly to a position shown in FIG. **1**, the lower guard **15** encases the exposed blade portion **11***b* by way of pivotal linkage between the link **18** and the lower guard **15**. In this state, if maintenance or changing of the saw-blade is required, the operator manually grips the lower guard **15** and can rotate the lower guard **15** in the direction B. In other words, the operation arm **17** is indirectly forcibly pivoted to a direction opposite the direction A against biasing force of the second spring **20**, so that angular positional relationship between the operation arm **17** and the link **18** is changed to allow rotation of the lower guard in a direction B. Therefore, the blade portion **11***b* can be exposed for conducting its changing etc. If the operator relaxes his hand, the operation arm **17** is

moved to a direction A to restore its original position by biasing force of the spring **20**, so that the lower guard **15** again encases the exposed blade portion **11b**.

Regarding the adjusting means for adjusting covering position of the lower guard **15** relative to the exposed blade portion **11b** in the upper rest position of the saw unit **50**, the covering range of the lower guard **15** is determinative by an angle θ (FIG. **1**) defined by a horizontal line passing though the pivot axis P_1 and a line connecting between the pivot axis P_1 and an axis of the pivot pin **23**. However, as described above, this angle would be changable due to minute dimensional errors in each of the mechanical segments and due to inaccurate assembly, thereby varying covering range of the lower guard **15** with respect to the saw-blade **11**. However, in the present invention, the adjusting bolt **22** urges the bottom wall **17***a* of the operation arm **17** to pivot the same about the pivot shft **5**, and the pivot angle is maintainable by the biasing force of the spring **20**. Therefore, in the present invention, optimum angle θ can be provided.

In view of the foregoing, according to the present invention, the operation arm **17** is spring-biased by the spring **20**, and the operation arm **17** has one end portion pivotally connected to the hinging member **3**, and the other end portion pivotally connected to the one end of the link **18**, and other end of the link **18** is pivotally connected to the lower guard **15**. As a result, the lower guard is normally urged toward a downward direction to cover the saw-blade **11** in the upper rest position of the saw-unit, and the lower guard **15** is also rotatable toward the upward direction against biasing force of the spring **20** for facilitating inspection and changing of the saw blade with minimized period of time.

Further, in the present invention, since the above described angle θ is controllable, the lower guard can sufficiently cover the saw-blade regardless of the dimensional error of the mechanical segments. In other words, easy assembling work is achievable yet providing sufficient encasing of the saw blade by the lower guard.

While the invention has been described with reference to a specific embodiment, it would be apparent for those skilled in the art that various changes and modifications can be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. A saw-blade guard arrangement in a motor driven chop saw, said chop saw including a saw table; a hinging member extending from said saw table and having a pivot shaft; and a saw unit pivotally movable with respect to said hinging member; said saw unit including a sawblade, an upper safety guard for partially encasing said saw blade, said upper safety guard pivotably connected to said hinging member through said pivot shaft, a motor casing connected to said upper safety guard, a motor housed in said motor casing, a drive shaft connected to said motor and fixing said saw-blade for its rotation, and a lower guard rotatable to a first direction for covering an exposed segment of said saw blade when said saw unit is in the upper rest position and rotatable to a second direction for uncovering said segment when the saw-unit is moved to the lowered operational position, said saw-blade guard arrangement comprising:

a first biasing means disposed between said upper safety guard and said hinging member for urging said upper safety guard toward its upper rest position;

an operation arm having one end portion pivotally rotatable about said pivot shaft;

a link member having one end pivotally connected to other end of said operation arm, and having the other end pivotally connected to said lower guard, said lower guard being rotatably connected to a bearing portion of said drive shaft;

a second biasing means disposed between said operation arm and said hinging member for urging said operation arm to a direction for urging said lower guard to said first direction; and,

an adjusting means for controlling orientation of said operation arm, said adjusting means being provided on said hinging member at a position adjacent an end face of said one end portion of said operation arm.

2. The saw-blade guard arrangement as defined in claim **1**, wherein said first and second biasing means are disposed over said pivot shaft.

3. The saw-blade guard arrangement as defined in claim **1**, wherein said adjusting means comprising a bolt, and a rib portion extending from said hinging member at a position adjacent said pivot shaft, said bolt threadingly engaged with said rib portion and being in abutment with said end face of said operation arm, axis of said bolt being spaced away from an axis of said pivot shaft, said end face being urged toward said bolt by said second biasing means.

4. The saw-blade guard arrangement as defined in claim **2**, wherein said first biasing means has one end engaged with an inner face of a rear wall of said upper safety guard, and the other end engaged with a spring seat projecting from said hinging member.

5. The saw-blade guard arrangement as defined in claim **2**, wherein said second biasing means has one end engaged with an inner face of a rear wall of said upper safety guard, and the other end engaged with a bottom wall of said operation arm.

* * * * *